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ABSTRACT

Four groups of aquatic weeds are described: algae, floating weeds, emersed weeds, and submersed weeds. Specific requirements for pesticide application are given for static water, limited flow, and moving water situations. The secondary effects of improper pesticide application rates are given for static, limited flow, and moving water, and the effects of faulty application are given. Finally, surface applied, total water column, and bottom acre-foot application are discussed. (BB)

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AQUATIC PEST CONTROL

This manual was developed in cooperation with the Georgia Department of Agriculture.

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SE 024 699

This training manual is intended to provide you with the information you will need to meet the standards of the Environmental Protection Agency for pesticide certification, and prepare you to take an examination given by the State Department of Agriculture based on this manual. It is not intended that this training will provide you with all the information you need for effective Aquatic Pest Control. Additional information in the form of publications and short courses can be obtained from the Cooperative Extension Service.

Appreciation is expressed to Dr. R. L. Carlton and others who reviewed this manuscript and made helpful suggestions.

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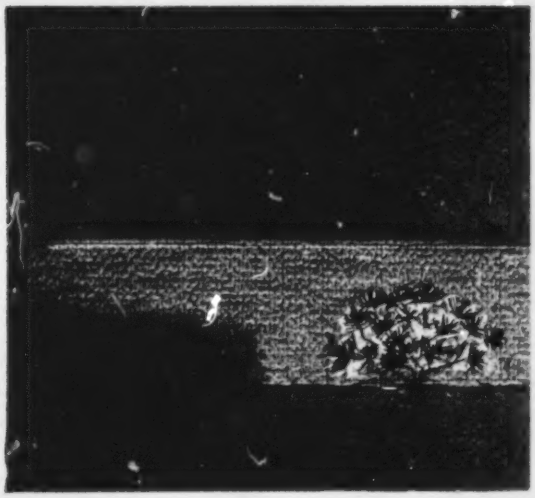
An excellent reference (1) is available in which specific recommendations are made for control of specific kinds of weeds. The status of each herbicide is also indicated as to whether it is "recommended" or whether it is "suggested" for use. Included among this information is data on rate of application, as appropriate to the treatment method chosen for control, as well as remarks which relate to water quality and restrictions regarding time intervals during which water should not be used for specific purposes, in order to avoid environmental hazards.

Various other reference materials are available to provide information on the biology and control methods for other aquatic pests which belong to the animal kingdom.

AQUATIC WEED GROUPS

There are several distinct differences in growth habits among aquatic weeds. As a result, aquatic weeds may be divided into four groups, with certain similarities within each group.



1. Algae

   There are several forms of algae, including filamentous algae (example, Pithophora sp.) and the so-called branched algae which includes musk grass (Chara sp.)

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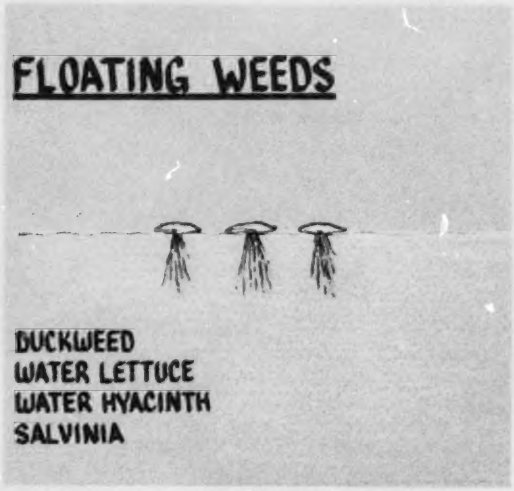
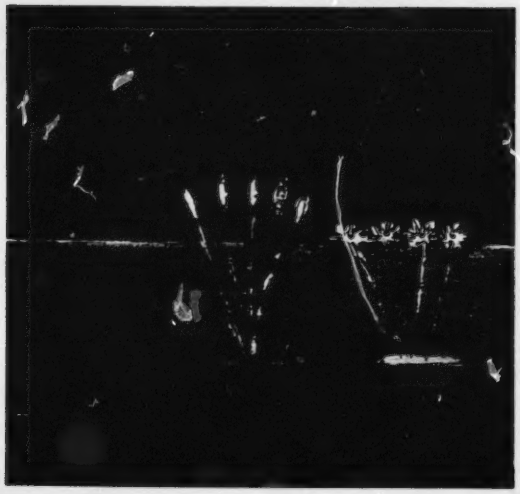
(1) Photographs or line drawings of examples of each of the four classes of aquatic weeds, along with a text including a description of the plant and its habitat, distribution and relative importance is contained in the publication entitled "Aquatic Weed Identification and Control Manual", published by the Bureau of Aquatic Plant Research and Control, Florida Department of Natural Resources.



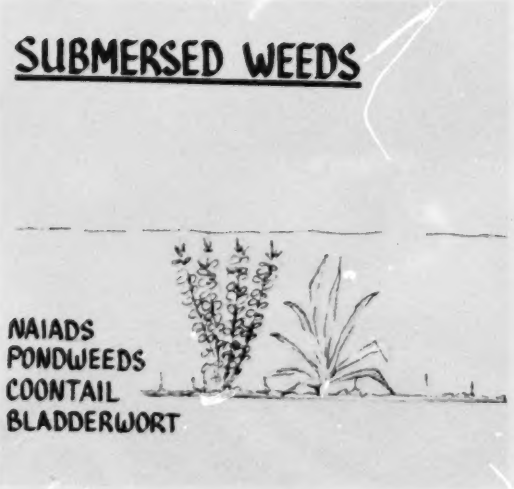
2. Floating weeds

Floating weeds are seed-bearing plants which float free on the water's surface, never becoming rooted in the soil, and are propagated by sexual and asexual means.



3. Emersed weeds

Emersed weeds are always rooted in the soil, with some leaves and flowers emergent above the water surface. The leaf form may differ for the plant portions which are above and below the water. These plants are seed-bearing, persistent and somewhat difficult to control.



4. Submersed weeds

Submersed weeds are rooted in the soil, as are emersed weeds, but the whole plant is covered by water. However, the flowering portion of the plant may emerge above the water surface.

OTHER AQUATIC PESTS

Several warm-blooded pests (such as muskrat, nutria, etc.) inhabit the aquatic environment. Occassionally, population numbers of these animals may cause them to become pests, requiring control. Commercial applicators responsible for control must be familiar with pertinent regulations and potential hazards to the environment as a result of control efforts.

SPECIFIC REQUIREMENTS

Specific requirements of commercial applicators in the aquatic pest control category relates generally to a practical knowledge in three areas, which may be defined as water use situations, secondary effects of pesticides upon organisms in the aquatic environment, and the principles of limited area application.

I. WATER USE SITUATIONS

Habitats for aquatic weeds involve various proporcions of water and soil, from intermittently wet ditches, to ditches which always hold standing water, to streams, to stock ponds, to farm ponds, to lakes, and to intermediate habitats. For purposes of this discussion, however, we can confine our attention to three types of water use situations.

A. Static water

Static water can be defined as water confined for considerable periods of the year, or totally confined within a known area with no movement of water to downstream locations. If a herbicide is applied for weed control, there is no reason to expect that any appreciable downstream effect may occur, except overflow resulting from unusual storm conditions. Water impoundments such as stock ponds, and in some cases farm ponds, will fit into this category.

B. Limited-flow water impoundments

This type refers primarily to farm ponds, lakes, and ditches. Ditches may be intermittently wet and dry, depending upon local climatic conditions. However, herbicides applied to habitats such as ditches may present some hazard to downstream locations, due to movement of the applied pesticide following an influx of water from surrounding areas. The purpose of the ditch is to drain the surrounding land area so considerable amounts of water must pass through the ditch area. In addition, many farm ponds may be characterized as having limited flow since there nearly always is an overflow pipe and an emergency overflow channel (spillway). The overflow pipe is designed to permit passage of a continuous and relatively well-defined amount of water at all periods of the year. The emergency spillway is provided to permit outflow of water from the pond at periods of the year when storm incidence may cause excess amounts of water to accumulate in the pond. In such cases, pesticide applications to limited-flow water areas may be found in small amounts in waters downstream from the application site. It is conceivable that larger amounts of pesticides from a treated area may be found downstream in the event of sudden rain storms, which interrupt or come immediately after pesticide application.

C. Moving water

Moving water is characterized as water found in small streams, creeks, streams, and rivers where there is always some detectable movement. Applied pesticides may be found in downstream locations in varying amounts away from the area of original application. Such situations present the greatest potential for concern as an environmental hazard.

II. SECONDARY EFFECTS OF PESTICIDE APPLICATIONS

A. Improper application rates

Proper application of herbicides to aquatic situations involves equipment calibration and calculation of appropriate water volumes in order to determine correct dosage rates. There are several well known and proven methods of equipment calibration and water volume calculation to determine pesticide application rates. Environmental hazard can result from the improper application rate.

1. Static water

If application rates are too low in a static water situation, desired kill of pests may not be accomplished. However, the water supply may be contaminated and unsuitable for use by livestock or as an irrigation supply. In the event of excessive application rates, damage to the fish populations may result, either from direct toxicity or an excessively rapid kill of plant materials which may result in oxygen depletion in the water, leading to suffocation of the fish population. Excessive application rates might also exclude

livestock from use of the water for a period of time, and would rule out the use of water supplies for irrigation for an indefinite period of time. However, little effect would probably be observed as far as downstream hazards are concerned, since little or no outflow normally occurs.

2. Limited flow water

Improper application rates could result in contamination of downstream water used by municipalities or communities for domestic water supplies. The hazardous condition would exist, whether limited-flow water sources were treated with an application rate too low to accomplish a desired kill of vegetation, or if the rate were excessive. It is conceivable that excessive rates might result in a too rapid rate of kill of vegetation which could lead to oxygen depletion and subsequent suffocation of the fish population. This might further complicate contamination of downstream water supplies utilized as domestic waters, due to bacterial contamination resulting from decay, or decomposition, of killed fish.

3. Moving water

Herbicide application to moving water is a common practice in the southeastern United States since there is little or no way to control downstream effects or environmental hazards. Application of such pesticides to moving waters may lead to at least temporary contamination of downstream water supplies which may be utilized for domestic consumption. In addition, the pesticide, though applied locally for pest control, is certain to move to other areas of the stream and affect various aquatic organisms.

B. Faulty application

There are two major hazards involved in faulty application of pesticides: (1) possible contact of applied pesticide with non-target organisms with resultant damage; (2) failure to apply the pesticide to the target pest resulting in no kill of the desired pest. For example, it would be hopeless to apply granular herbicides in fast moving water, whereas they might work quite well in static water impoundments, and even in limited-flow water situations.

All currently registered herbicides employed for aquatic weed control are rated as limited, or not at all toxic to fish, birds, insects, and other aquatic organisms so long as proper application rates and techniques are employed. Other pesticides labels should be carefully observed to ensure that the aquatic environment is not unduly contaminated as a result of pest control efforts.

III. LIMITED AREA APPLICATION

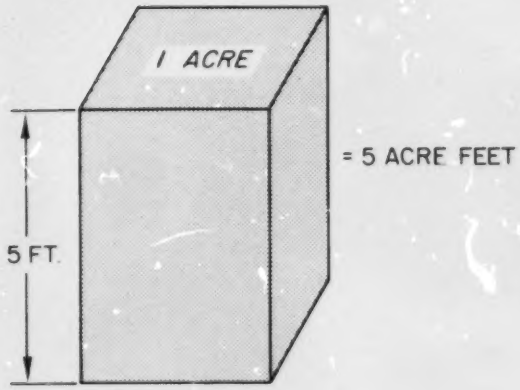
Aquatic weeds may occur in the whole body of water, as submersed weeds, or may appear to cover the whole surface of the water, as floating weeds. Conversely, the same weeds or other pests may occur only in limited areas within a body of water, whether it is a static, limited-flow, or moving body of water. "Limited area application" implies the advantage of improved safety to aquatic species, specifically the fish population. If pesticides that are potentially toxic to the fish population are applied to a limited area, the fish population can move to untreated water areas and escape potential toxic effects. Also implied in this concept is that a minimal amount of pesticide is applied which tends to reduce the potential effect upon downstream environments in the event of spillover from the treated body of water.

There are essentially three areas in the body of water which may be treated-

the surface, the total water column, and "bottom acre-foot" treatments.

A. Surface-applied treatments

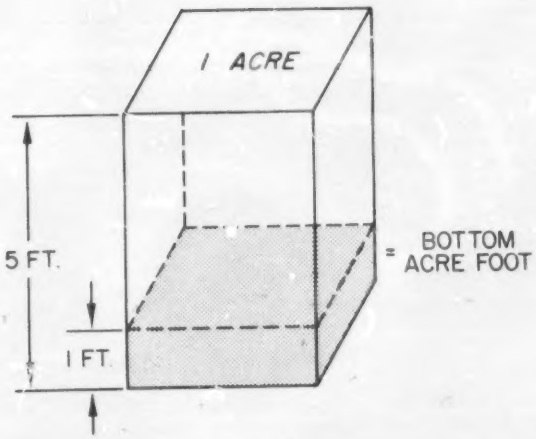
Contact pesticides are generally applied to control floating weeds. Generally only one-fourth to one-third of the surface area of the body of water is treated at a time, to reduce the possible hazard of oxygen depletion resulting from too rapid kill of large masses of vegetation in the water, which may affect the fish population.



B. Total water column treatments

In this application technique, frequently employed with emersed weeds and often employed with algae treatments, the whole body of water (including the water column from bottom of the water impoundment to the surface) is treated. The entire volume of the body of water is calculated and the chemical is added to reach a specified dilution in the total water column. An alternative is to calculate the entire water body and then treat only one-fourth or one-third of the total water column, based on surface area, confining the treatment to selected sections of the pond where the pest infestation may be more intense. Specific application techniques include injection directly into the water with the undiluted chemical, or some

dilution of the chemical sprayed or cast upon the surface of the water. With either method, further dispersal throughout the water column is dependant upon water currents. Aquatic granules are formulated to provide rapid sink to soil-water interfaces to control emersed and submersed weeds.



C. Bottom acre-foot treatments

This is a specialized application technique which is intended primarily for control of submersed aquatic vegetation. A boat carrying application equipment drags a hose or boom over and just above the lake or pond bottom. The chemical is dispersed through nozzles and specific gravity of the chemical causes the treatment to remain near the bottom and in the proximity of the rooted, submersed weeds. Fish can move out of this water level and avoid any direct contact with the chemical until chemical residues are diluted or dissipated.